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GENERAL INSTRUCTIONS

FOR THE DESIGN AND
CONSTRUCTION OF

NAVY PORTS, HARBORS AND
COASTAL DEFENSES

1901



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RS
UNITED STATES DEPARTMENT OF AGRICULTURE
BUREAU OF PUBLIC ROADS

GENERAL INSTRUCTIONS
TO
RESIDENT ENGINEERS AND
SUPERINTENDENTS OF CONSTRUCTION
ON
NATIONAL FOREST ROADS AND
NATIONAL PARKS ROADS
1926



WASHINGTON
GOVERNMENT PRINTING OFFICE
1926

For use on national-park projects the following alterations are to be made:

1. Wherever the word "Forest" appears the word "Park" shall be substituted.

2. "*General*."—It is expected that the landscape engineer of the Park Service will visit the project at intervals during construction. The resident engineer shall cooperate with him in every way possible.

The specification under which the resident engineer is working in national parks carry several provisions differing quite widely from those on forest projects. The resident engineer shall give special attention to these requirements and do everything possible to preserve the ground cover and avoid scars. The landscape engineer's suggestions along this line shall be given special consideration.

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GENERAL INSTRUCTIONS TO RESIDENT ENGINEERS AND SUPERINTENDENTS OF CONSTRUCTION ON CONSTRUCTION ON NATIONAL FOREST ROADS

GENERAL

National forest roads will be constructed in two general ways: First, and preferably, by contract; second, by day labor and by letting subsections to station contractors in amounts not exceeding \$2,500. Procedure under each method is described in order.

CONTRACT PROJECTS

Preliminary Work.—The resident engineer will be designated by the district engineer and will represent him on the project during the construction period under the contract. Before leaving the district office he will supply himself with the necessary equipment shown on the approved list. (See Resident Engineer's Equipment Check List, p. 14.) He will familiarize himself with all correspondence in the office files relating to the project, paying particular attention to that part pertaining to finances, cooperative agreements, right-of-way problems, and land-tie records. He will study any necessary plans for closing the road to travel during construction. It will be necessary for him to be thoroughly familiar with the fiscal and administrative regulations of the United States Department of Agriculture, and particularly with the details of the cost-keeping system. For this purpose he should consult the auditor's office and study the manner of carrying the detailed cost record on Form F. R. 57 for the engineering expenses, contract costs to the Federal Government on Form F. R. 58, the approved system of keeping the actual cost of the work to the contractor (including the costs to station men), and 5-A vouchers for monthly estimates. (See General Instructions for Field Cost Accounting, Reports, and Forms on National Forest Roads.)

Assistants.—On larger projects two or more assistants will be required, and the first assistant must be able to use a transit or level and to set grade and line stakes and inspect any construction involved. The resident engineer will confer with the district engineer before leaving headquarters as to the number and duties of assistants. Field draftsmen, rodmen, tapemen, and axmen or other assistants will, wherever possible, be employed by the resident engineer on the ground, under the Civil Service Rules.

Staking Out.—The resident engineer will proceed to the project in advance of construction operations to see that sufficient stakes are set for the contractor's guidance when active operations commence, giving due consideration to the contractor's indicated plan of work. He will continue staking out the work as far in advance of construction as possible, completing the entire staking at the earliest possible moment, in order that the size of his party may be reduced. Where heavy timber and brush are encountered it may be desirable to postpone setting slope stakes until the right of way is cleared. It must be remembered that stakes inevitably will be lost or disturbed. The center line must be a transit line carefully run and accurately chained and must be fully referenced by accurate transit ties. It is very important that the field notes be complete so the center line can be accurately rerun. Back sights or fore sights placed outside of the right of way are of great value. An accurate profile must then be prepared. Slight adjustments from the grade as shown on the plans may be necessary, due to more accurate chaining or changes in alignment, and should be made at this time. Slope stakes should be supplemented on the bank or cut side by a reference stake set at a standard interval, not less than 4 feet back from the top of the cut, well defined, and marked with elevation.¹ Slope stakes should be set frequently enough to serve the contractor's needs and at all breaks in classification.

In rugged country not all cross sections necessary to determine the quantities need be staked. Care must be taken on curves of short radii to stake sections on radial lines. The

¹ The resident engineer should instruct the contractor at the earliest moment of the method of interpreting the marking on the slope stake and its reference.

contractor should be supplied with such supplementary guides (including tables of balanced sections and quantity diagram, if made) as will facilitate the progress of the work. All changes of slope in excavation should be finished by a gradual change of slope to give a workmanlike appearance.

When rough grading is completed the center line shall be rerun and grade hubs shall be set every 50 feet for finishing (on short curves every 25 feet). The center and one hub on each side will usually be sufficient. In setting the finishing hubs proper allowance shall be made for superelevation and shrinkage. The resident engineer shall see that the ditches are constructed true to grade and alignment, giving extra stakes when necessary to secure good work.

Maintenance Stakes.—Maintenance stakes 2 by 4 inches in size should be set at 1,000-foot intervals and marked with a timber scribe before leaving the project.

Drainage Structures.—All drainage structures shall be staked carefully, always avoiding altering the grade or flow line of a stream. When the contractor borrows and wastes extend culverts accordingly.

When possible extend the down-hill end of pipe culverts and omit head walls on the down-hill end to allow for future widening.

Cost Keeping.—On large projects one member of the party should be designated as field clerk or cost accountant, and it will be his duty to determine daily as nearly as possible the cost to the contractor of labor, materials, rental, and depreciation of equipment, and field and general office overhead. His records will be made in the field cost book and, as far as possible, based on daily routine reports from the contractor's foreman (Foreman's daily report, Form F. R. 56), inspection of the contractor's bills, and the contractor's and subcontractor's books. Cost items should be checked from time to time with the contractor.

Cost keeping on contract jobs should not be regarded as a perfunctory operation, but should be viewed as an essential part of the conduct of the residency. Its purpose is to determine daily the cost of doing the work under the given conditions. It has great value in disputes or lawsuits, in determin-

ing the proper charge for extra work, and for estimating the costs of future projects.

Quarters.—The resident engineer will be expected to use the best possible judgment in the location of his headquarters to minimize the cost of transportation and the loss of time. He should provide a field office for drafting and computations either in a separate room in a hotel or boarding house or a tent.

Fires.—On contract work when the Forest Service has a special representative on the ground during any period of burning this representative will be responsible for the direction of such operations. The resident engineer will confer with the nearest Forest Service official relative to burning when no such representative is on the ground. Under the contract the contractor must immediately, at his own expense, extinguish all fires which he or his subordinates start. The resident engineer, in the absence of a Forest Service representative, will vigorously enforce this requirement of the contract and will assist in every way at all times in the prevention of forest fires. He will make special entry in his diary of dates of rain, weather, and cover conditions during any burning, and keep a complete record of all action in respect to fires.

Records of the Work.—1. *Diary.*—A diary shall be kept of the progress of the work, activities of the men, and all incidents relating to the work.

2. *Classification notes.*—The resident engineer will inspect the location for classification before undertaking any revisions, comparing the classification indicated on the original cross sections with the ground, and making the required notations thereon with an initial and date.

3. *Field notes.*—Field notes for the construction of a project will be kept as follows:

(a) *Transit book of alignment.*—In the books under this heading a record will be kept of the transit line of the location and all revisions thereof. The notes will be kept in standard manner and in accordance with the best practice.

(b) *Levels and cross-sections book.*—In the books under this heading will be kept all the original level and cross-section notes for staking out the project. A classification will be made

of the earthwork quantities, stating by whom made and the date.

(c) *Clearing and grubbing*.—This book will be the record and will contain measurements in detail concerning the clearing and grubbing done at all points on the project.

(d) *Structures*.—This book will be the field record of all action relative to the structures of the project. Herein all staking shall be noted and all final measurements indicated in detail.

(e) *Final measurements book*.—Frequently it will be necessary to completely re-cross section portions of the work as in case of overbreak, change in slope, authorized borrow, or widening of certain sections. Supplemental cross sectioning may be required to determine quantities of rock excavation. Field records of such work should be kept in this book.

(It is not proposed to establish the practice of final cross sectioning of the entire project, but whenever necessary on account of exigencies on the work such re-cross sectioning as may be required shall be kept in this book.)

(f) *Monthly estimate book*.—At the end of each month, when the resident engineer prepares the data for his monthly estimate, his notes shall be kept in the monthly estimate book. Here shall also be entered all computations used to arrive at the amount of the monthly estimate. Each monthly estimate shall be dated and signed.

The size of the project under construction will determine the number of books needed in each of the above series.

In order that the field notes may be readily understood by anyone having occasion to refer to them each book shall be kept with scrupulous care, in full detail, and in accordance with standard practice.

Each book shall have a complete index and shall be carefully cross-referenced to the rest of the series.

4. *Calculation of areas*.—Calculation of areas by the criss-cross method or by triangles direct from the field notes is permissible, but slope tables for final estimates are not to be used without special permission from the district engineer and only in uniform country. Whenever necessary the staked cross sections shall be plotted on standard sheets and the constructed

sections shown thereon. End areas shall then be calculated or measured by planimeter and checked. Quantities shall be computed by the method of average end areas. It is essential that the records of all quantities be kept in a clear, uniform manner so that they can be understood by others.

Classification.—When excavation and recross-section work is complete for any section of the road, and always before monthly estimates for such sections are sent to the district engineer, the resident engineer will determine his classification and then take the corresponding revised or final notes or plotted cross-section sheets to the ground, and again examine, in company with the contractor or his resident foreman, each station for classification indicated by the cut; he will make any required supplementary notes regarding classification in his records, in the presence of the contractor or his foremen, and date and initial same.

If the contractor (or foreman) disagrees with the classification the resident engineer shall request him to state his claim, which shall be also recorded and initialed by the contractor (or foreman) in such cases of disagreement, but the resident engineer will not attempt to revise his own classification, whether in final agreement or disagreement with the contractor. The record of the contractor's opinion in this respect is merely a memorandum for the information of the district engineer.

The resident engineer will understand the necessity of not coming to any compromise agreement as work progresses on any section or cut, which would establish in the mind of the contractor a precedent for another cut and might easily cause a distortion of the total classification.

The engineer should photograph and carefully label with date all slopes where any considerable divergence of opinion regarding classification occurs, especially if there is any danger of a slide covering the slope.

Under specifications which classify excavation material it will, however, in most cases be necessary to recross-section or take final sections on all rock cuts in order to determine the item of overbreak.

The above instructions are intended to avoid as far as possible any misunderstanding as to classification on contract jobs

by establishing a complete record of time, place, and authority for such classification and to keep the contractor fully informed as work progresses as to just how the excavation material is classified.

Borrow-and-waste Method.—In cases of steam-shovel work where borrow-and-waste methods are allowed, the resident engineer must at the outset notify the contractor in writing that any excess material above the quantities in the designed or stakes prism shall not be pay quantities, and that waste must be uniformly and neatly placed to widen fills and never piled on the edge of the fill above the grade. In all such cases of borrow and waste the exact location of the staked center line must be carefully preserved and finishing stakes must be set.

Preservation of Trees.—When fine trees grow adjacent to or in the right of way the Forest Service desires to protect and preserve all that can be left after construction is finished. Such trees will, in general, be selected by a representative of the Forest Service in cooperation with the resident engineer and will be tagged by the Forest Service representative "Do not cut or injure."

Monthly Estimate.—At the end of each month the contractor will receive an estimate of the quantity and value of the work done to date. The amount of work shown should be carefully measured and items numbered in accordance with the numbers in the contract. The estimate should be prepared and ready for the contractor promptly on the first day of the succeeding month. It is especially important for the general good of the service that estimates be rendered very promptly and every effort consistent with accuracy should be made to deliver the estimates on time.

The resident engineer will support his monthly estimate to the contractor by the detailed calculations by stations in the construction notebook which he retains, and by monthly supporting data which will be attached to the monthly estimate. The supporting data will inform the contractor of the necessary details of the estimate for the month. (See "General Instructions for Field Cost Accounting, Reports, and Forms on National Forest Roads.")

The estimate will be made out in quadruplicate on Form 5-A, and must bear the resident engineer's signature as certifying

officer. The original copy of the monthly estimate will be sent to the contractor with supporting data attached, with the request that the contractor sign and acknowledge receipt of the supporting data (which he will be requested to detach) and return the signed voucher, which with two copies will then be forwarded to the district engineer.

Extra Work.—Whenever the contractor is to do extra work authority from the district engineer to the resident engineer will be required. The contractor shall receive a written order from either the district engineer or the resident engineer to do the work, and any reference to such order will be by number and date. This order shall describe the work to be done and state the maximum labor prices to be paid for such work. The voucher for the payment of this work shall be accompanied by a list of the details of costs, certified to by the resident engineer with the statement that he has made the necessary examination of the contractor's invoices of supplies and materials (including freight) furnished for the extra work, and has verified the rental charge for equipment and machinery. This supporting data shall also be accompanied by the original voucher for materials used exclusively for such work or by reference to filed written agreements for unit prices or lump sum.

Completion of Project.—Upon the completion of the construction of a national forest road project the resident engineer shall so certify in writing to the district engineer. Upon receipt of the notice of completion the district engineer will immediately request the district forester to inspect the clearing and grubbing done on the project and advise as to his findings. The district engineer will then make a final inspection.

Maintenance Records.—The resident engineer shall prepare a final report and a final map showing all field revisions of line and grade on the tracings of the original location. In addition he should prepare a profile of the constructed line for use in maintenance, on a scale of 40 feet to the inch vertically and 400 feet to the inch horizontally, showing thereon all culverts and structures. On this profile also should be shown the location of maintenance-station stakes. The final report should show any sections that will require surfacing by gravel or broken stone and the best probable source of supply.

Photographs.—Sufficient photographs must be taken during the progress of the work and on its completion to show clearly the methods and results, preferably by “before, during, and after” comparison pictures.

Disposition of Property and Equipment.—At the conclusion of the construction all records and papers shall be immediately forwarded to the district engineer. The district engineer will advise the resident engineer as to the disposition of property and equipment. In general such property and equipment will be returned to the district office, but in exceptional cases it may be transferred to other projects by order of the district engineer.

Additional Points.—(a) Slope stakes are not necessarily to be set on the slope shown on the plotted cross section. Inspection may indicate that the material is harder than appeared at the time of the survey and a steeper slope may be used. As excavation progresses the resident engineer should be guided by the nature of the exposed materials and, if necessary, shift slope stakes accordingly.

(b) On full sidehill cuts there is generally much waste cast over the bank, which lodges to a considerable extent, except in extreme cases, and often an excessive width of roadway results. A certain amount of extra width is not undesirable on steep sidehills, but if inspection indicates an unnecessary widening, the roadway should be moved or “pulled” out somewhat from the hill to save cut. No chances should be taken, however, of the embankment sloughing, and as construction progresses the engineer should be guided by the action of the material. On embankment slopes mixed rock and earth will generally hold somewhat steeper than $1\frac{1}{2}$ to 1, and clear rock in good-sized fragments at $1\frac{1}{4}$ to 1.

(c) A ditch and berm at the toe of the slope on sidehills is of value in holding embankments. However, it will be inadvisable to locate these ditches until construction is under way and the exact position of the center line is decided upon.

(d) Whenever possible waste material shall be utilized in widening the roadway on sharp curves. Passing traffic requires extra width at such points.

(e) Corrugated pipe in excess of 30 inches in diameter shall not be used. Remember that such pipe is obtainable in lengths

varying by 2 feet. Results of pipe inspections shall be reported on the form reproduced on page 13.

(f) Structures shall be measured immediately on completion. Span dimensions of culverts shall be reported first.

(g) Comply with the recommendations of the subcommittee on Control of the Board of Surveys and Maps of the various Federal departments by observing the following points:

(1) Permanently monument the beginning and end of each project and tie the survey to any existing surveys in the vicinity.

(2) Where possible, use permanent reference marks for other transit points. An example would be a spike driven through a metal washer outside the zone of disturbance and as near on level with final grade of the P. I. as may be.

(3) Calculate the bearings recorded on the plans and correct any errors to show the true bearings.

(4) Show on the final plans the stationing of both ends of all important structures constructed.

(5) Where possible use level datum of United States Geodetic Survey or United States Geological Survey and see that permanent bench marks are established at the beginning and end with intermediate permanent bench marks where possible. Establish a permanent bench mark on all important structures.

DAY-LABOR CONSTRUCTION

On day-labor construction projects the superintendent of construction is in charge of the construction. He is responsible for the class and progress of the work, its costs, conditions in the camp, and the welfare of the men. An engineer will be assigned in charge of the engineering. He will cooperate with the superintendent of construction but will report to the district engineer.

Preliminary Work.—Before proceeding to the project both superintendent and engineer will familiarize themselves with the incidents pertaining to the work. (See "Contract projects—Preliminary work.") On arriving at the project the superintendent will make a careful inspection of the entire layout and prepare a written report to the district engineer, giving his plan of operations in detail. This report will in-

clude: (a) Location and kind of camp and proposed camp equipment; (b) method and order of carrying out construction by sections; (c) construction equipment; (d) engineering force and organization of same.

Camp and Camp Equipment.—Camps must, if possible, be located near a fresh-water supply and on well-drained ground. Special attention must be given to the sanitation, and provision for all waste disposal must be perfect. Camps should be comfortable. The mess room should be attractive and the cook house should be screened. The commissary store should be clean and well protected from moisture and should be locked. Cooling provision for perishable food must be made. Camps must be located with reference to duration and extent of each section of the work. Frequently more than one camp will be needed during all or part of the work. Placing and moving camps has a considerable effect on the economy of construction. The superintendent is responsible for selection of camp sites accessible to men and supplies. In no case will a stable be permitted within 600 feet of the men's camp.

Method of Carrying Out Construction.—Forest road work is usually at remote points, is necessarily done in a short working season, and frequently is of too narrow or light a type to permit the use of steam shovels. It must be skillfully organized for success.

The management of clearing and grubbing operations is usually the first item of construction to be considered. This item and rock excavation involve explosives. A powder house (or two) must be located and (usually) built and must comply with the State law regarding distance from the highway, etc.

If powder must be shipped by freight it must be ordered well in advance. It must always be handled by experienced men. Avoid waste of powder, particularly in grubbing.

All burning must be done in strict accord with Forest Service and State regulations. The entire road crew may also at any time be requisitioned for fighting fire and must be then immediately released. For further details on clearing and grubbing see standard forest road specifications.

The report to the district engineer should show in detail the proposed methods of drilling and blasting and the removal of

rock and whether or not station gangs are available, and to what extent, also the proposed method of excavating common material.

Construction Equipment.—The question of the employment of any special equipment must be settled as soon as possible—such equipment includes especially steam shovels, industrial track and cars and power drills. Storage for small tools, blacksmith supplies, etc., must be arranged for well ahead. Especially is this necessary where the project is in high altitudes and the working season is short. In bridge construction and for supplying boilers, etc., pumps are often required. The report to the district engineer should consider the advisability and necessity of pumping through any considerable distance and list the pipe and machinery.

Engineering Force and Organization of Same.—The superintendent of construction is in responsible charge of day-labor construction projects. The engineering assistants are to cooperate with him. This arrangement does not relieve the superintendent of construction of any responsibility for the details and efficiency of his working force on the project. When in doubt as to any changes in the design shown on the plans the district engineer should be immediately consulted.

The engineering assistance required shall be reported in detail by the superintendent of construction in his written report to the district engineer.

Accounts and Reports.—For details of accounting on day-labor construction projects, see "General instructions for field cost accounting, reports and forms on national forest roads," particularly in respect to Form F. R. 58 and the Field Cost Book. The instructions to residents on contract projects with reference to construction notebooks, traffic, right of way, staking out, additional points, etc., and general conditions of a residency on contract construction govern on day-labor projects.

Station Contracts.—The required procedure for construction by station contract is presented in the fiscal regulations of the United States Department of Agriculture. Avoid exceeding a \$2,500 payment on station contracts. Payments of greater amounts must be especially authorized by the Secretary.

The bond for station work must be satisfactory to the district engineer.

AMENDMENTS

These instructions may be amended from time to time and in such instances resident engineers will be furnished copies of the necessary corrections to be inserted as a part of these instructions.

BUREAU OF PUBLIC ROADS

DISTRICT No. --

(Address of district)

INSPECTION AND TEST OF CORRUGATED METAL CULVERT PIPE

Project..... Section.....
 Date..... Inspected.....
 Metal manufactured by.....
 Fabricated by.....
 Contractor.....

Quantity				Corrugations			Rivets		Condition of—	
No.	Diameter	Represented	Gauge	C. to C.	Height	Size	Longitudinal spacing	Transverse spacing	Spelter	Rivets

SPELTER TEST

Laboratory.....
 Samples received..... Samples taken from { Flat sheets.
 Date of test..... { Fabricated pipe.

Sample No.	Area	Condition of spelter	Gauge No.	Zinc per square foot		Preece test Cu-Sulphate	Remarks
				Pb-Acetate	Sb-HCL		
	Sq. in.						

RECOMMENDATIONS

RESIDENT ENGINEER'S EQUIPMENT CHECK LIST

Resident engineers will determine the equipment needed from the following list:

ENGINEERING EQUIPMENT

- | | |
|---|---|
| 1 Y level, with tripod, hood, and shipping box. | 1 double-bitted axe with extra handles. |
| 2 100-foot steel tapes. | 1 folding draw knife. |
| 1 50-foot metallic tape in case. | 1 brush hook with extra handles. |
| 5 50-foot metallic tape fillers. | 3 plumb bobs. |
| 2 level rods, one with target and one without target. | 10 yards plumb-bob string. |
| 1 light 13-foot or 16-foot single-piece rod. | 1 pound hub tacks (stake tacks). |
| 2 line rods. | 2 pounds bench-mark nails (10 penny). |
| 1 dozen Eureka or Little Giant tape splices. | 1 camera with tripod; films (based on 3 rolls to mile). |
| 2 16-foot rod ribbons. | 1 Form 99 (photo-exposure record). |
| 1 Abney level with leather case (latest model). | 1 whetstone. |
| 1 Locke level with leather case. | 1 gad and one 4½-pound hammer for driving. |
| 5 solid bound notebooks. | 1 six-foot cross-cut saw. |
| 2 field chests with padlocks. | 2 stake bags. |
| 1 transit with tripod, hood, and shipping box. | ½ dozen 8-inch flat files. |
| 12 sheets structure paper. | 1 small pack sack (for lunch). |
| 100 quantity sheets. | 1 set standard specifications. |
| 1 No. 3 Boy Scout axe with sheathe. | 2 wedges (iron splitting). |
| 2 boy's axes with extra handles. | 1 book rack. |

DRAFTING SUPPLIES

- | | |
|--|---|
| 1 folding drawing board for field use. | 1 protractor, 6-inch radius. |
| 1 12-inch scale (engineer's, flat, 10 by 50). | 1 French curve. |
| 1 six-inch scale (engineer's, flat, paragon K & E 1419 P). | 1 planimeter (if necessary). |
| 2 stools. | 1 sheet celluloid for templates. |
| 1 3-inch scale (engineer's, 10 by 60). | 1 supply chest (wooden). |
| 1 30°, 18-inch triangle. | — yards profile paper (1 yard to the mile). |
| 1 45°, 12-inch triangle. | — yards detail paper 48 inches wide (1 yard to the mile). |
| 1 30°, 6-inch triangle. | 6 sheets cross-section paper (thin) to the mile. |
| 1 set drafting instruments (personally owned). | 1 bottle black drawing ink. |
| 1 steel straightedge 30-inch (to fit field chest). | 1 bottle orange drawing ink. |
| 1 T-square, 30-inch. | 1 bottle blue drawing ink. |
| | 1 bottle red drawing ink. |
| | 1 gasoline office lamp. |
| | 1 curve templet. |

GENERAL OFFICE SUPPLIES

- | | |
|---|--|
| <ul style="list-style-type: none"> 1 dozen 4-H pencils. ½ dozen 6-H pencils. 2 dozen 3-H pencils. 1 dozen pencils (Nos. 2 and 3). 6 pencil clips. 6 penholders. 2 dozen Esterbrook pens, No. 802. 1 dozen Gillott pens, No. 170. 1 dozen Gillott pens, No. 303. 1 dozen Gillott pens, No. 404. 1 bottle fountain-pen ink (½ pint). 2 tubes glue. 3 diaries. 2 time books. 1 dozen blotters. 2 sandpaper pads (pencil pointers). 1 dozen sheets pencil carbon. 2 I-P binders, No. 701. 1 Triumph punch. 1 box eyelets (same size as Triumph punch). 1 pair shears (9-inch). 1 dozen pencil erasers. ½ dozen ink erasers. 2 boxes carbon paper (letter size). 6 scratch pads, small (5 by 8). 6 scratch pads, large (8 by 10). 100 rubber bands, assorted. 100 thumb tacks. 5 yards cloth for dust rags and pen wipers. 2 dozen medium graphite lumber crayon, red and blue (2 dozen each color). 300 paper clips. 12 cardboard backs for filing field notes. 2 pyramids of pins. 100 letterheads. 200 sheets paper (20-pound). 300 sheets yellow paper. 100 franked envelopes. 25 franks. 50 franked envelopes, addressed to district office. | <ul style="list-style-type: none"> 1 pad letterheads, ruled. 50 Manila franked tags. 1 rubber stamp with name of project. 1 stamp pad. 6 dozen Form M 111 (daily report card). 2 dozen Form 4A (reimbursement vouchers). 2 dozen Form 4 (inserts). 5 dozen Form 5a (vouchers). ½ dozen Form A 330 (project report). ½ dozen Form A 300 (distribution). 1 dozen Form 2B (field pay roll). ½ dozen Form M 150D (field book order pad). 4 dozen engineers' report, weekly Form F. R. 57. 2 dozen Form 3A (pay voucher). 2 books Form 4b (subvoucher). 1 book 4-C (party voucher). 1 dozen Form M 119 (office requisition). 1 pad exemption certificates. 1 pad telegraph blanks. 1 book transportation requests. 3 accident reports (3 forms). 10 express charge slips. 20 Forms M-124 (receipt of non-expendable property). 10 Forms M-123 (property lost or destroyed). 50 Forms F. R. 58. 50 Forms Department 15 (informal proposal for supplies). 1 broom. 2 chairs (G. M. folding arm; not stools). 1 spool flax thread (black). 1 fiscal regulations. 1 property regulations. 1 administrative regulations. |
|---|--|

MESS AND CAMP EQUIPMENT

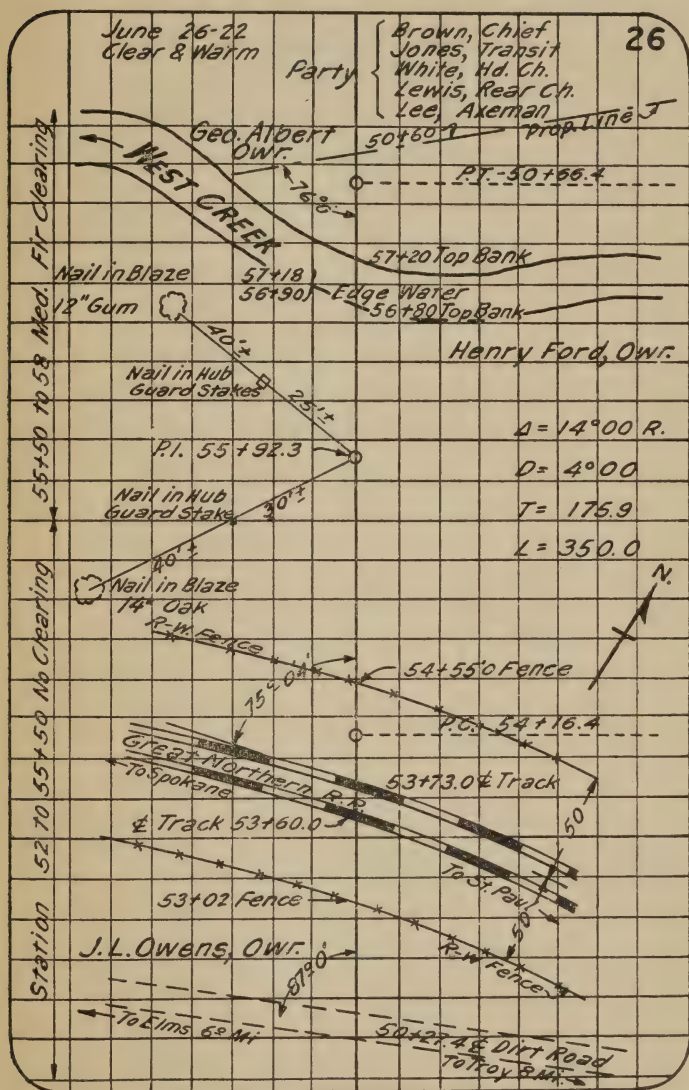
(Suitable for 5 to 8 men)

- | | |
|---|--|
| 3 washbasins. | 1 hammer. |
| 2 buckets (galvanized, water). | 1 box tacks (carpet). |
| 1 skimmer (large). | 2 pitchers (1-gallon). |
| 2 dippers (quart). | 1 grater. |
| 6 camp kettles, 1½ to 4 gallons (to nest), with covers. | 2 cupboard boxes. |
| 1 coffee boiler, 1 gallon. | 4 shakers, small, salt and pepper. |
| 2 paring knives. | 2 frying pans (11 inch top diameter). |
| 1 carving fork. | 2 frying pans (18-inch top diameter). |
| 9 teacups. | 9 soup bowls. |
| 9 saucers. | 1 broom. |
| 1 dishpan (14-quart). | 2 sirup pitchers. |
| 2 dishpans (17-quart). | 3 drip pans (size to fit oven). |
| 1 teapot (1 gallon). | 12 dish towels (10 yards cotton crash). |
| 9 table forks. | 1 hand ax. |
| 9 table knives. | 25 feet wire. |
| 9 table spoons. | 1 pair pliers. |
| 9 teaspoons. | 6 cans Old Dutch Cleanser. |
| 2 meat platters (16 inches long). | 6 hasps. |
| 1 cake turner. | 2 files. |
| 2 can openers. | 1 screw driver (12-in., perfect handle). |
| 1 washboard. | 12 pounds nails (assorted) |
| 1 flour sieve. | 4 pounds 8-penny, 4 pounds 10-penny, 4 pounds 12-penny. |
| 1 egg beater. | 1 roller pin. |
| 1 meat saw. | 3 padlocks. |
| 1 No. 2 universal food chopper. | 1 handsaw. |
| 1 spring balance (to weigh 100 pounds). | 1 dining-room table with horses (made in field). |
| 1 saddle bag, canvas (optional). | 1 kitchen table with horses (made in field). |
| Water bags (1 and 5 gallon bags; locality governs number required). | 1 14 by 16 tent with flies (5-foot walls); office tent (this for 8 men only); add one 12 by 14 tent for each 3 additional men. |
| 5 G. M. folding cots No. 1. | 1 16 by 20 mess tent with flies (5-foot walls). |
| 1 butcher knife (10-inch). | 2 12 by 14 sleeping tents with flies (4-foot walls). |
| 1 funnel. | 2 12 by 14 sleeping tents with flies (4-foot walls). |
| 9 sauce dishes. | 1 7 by 9 tent with flies (for cook). |
| 1 cooking range (4-hole). | 1 American flag, 4 by 6 feet. |
| 1 scrub brush. | |
| 1 washtub. | |
| 2 balls twine. | |
| 1 large pancake griddle (soap stone). | |
| 2 soup ladles. | |
| 2 large spoons. | |
| 12 dinner plates. | |
| 1 whetstone. | |
| 5 yards oilcloth. | |

- | | |
|--|--|
| <ul style="list-style-type: none"> 1 Sibley or hot-air blast stove for each office and sleeping tent, except in midsummer. Oil lamps (optional). 3 lanterns (optional). 3 lantern globes (extra). 1 gas lantern with extra mantles for winter use. 1 lantern box with pad. 50 feet rope, $\frac{1}{2}$ inch. 50 feet rope, $\frac{1}{4}$ inch. 1 shovel, long handle, 1 pick, railroad, with extra handles. 1 sledge with extra handles (6-pound). 1 first-aid kit. 1 small funnel with gasoline lantern. 1 Big Ben alarm clock. 1 bread board (20 by 24 inches). | <ul style="list-style-type: none"> 1 meat cleaver (8-inch). 6 tin pie plates. 2 1-gallon, galvanized-iron, flannel-covered, zinc screw-top canteen (optional). 2 2-quart, galvanized-iron, flannel-covered, zinc screw-top canteen (optional). 1 teakettle (2-gallon), aluminum. 1 shoemakers' last. $\frac{1}{2}$ dozen cans chloride of lime. 500 paper napkins. 25 yards mosquito netting. 2 sugar bowls (white enamel). 1 colander (9-inch). 2 butter dishes. Vegetable dishes (white enamel ware). 3 6-quart stew pans. 2 1-quart pitchers. 1 potato masher. |
|--|--|

<i>Construction Alignment Lyndale Project</i>					
<i>Sta.</i>	<i>Dist.</i>	<i>Curve Data</i>	<i>Cal. Bearing</i>	<i>Mag. Bearing</i>	<i>Def.</i>
			N.57°30'W.	N.60°20'W.	
+66.4 P.T. +50					7°-00' 6°-40'
57					5°-40'
+50		$\Delta = 14^{\circ}00'R$			4°-40'
		$D = 4^{\circ}00'$			
56		$S.T. = 175.9'$			3°-40'
+92.3 P.I.		$L = 350.0'$			
+50					2°-40'
55					1°-40'
+60					0°-40'
					0°-0'
+16.4 P.C. 54					
			N.71°30'W.	N.72°-0'W.	
53					
52+00					

Typical construction transit notes, left page



Typical construction transit notes, right page

<i>Level Notes</i> <i>Lyndale Project</i>				
<i>Sta.</i>	<i>+</i>	<i>H.I.</i>	<i>-</i>	<i>Ground</i>
<i>B.M.</i>				<i>1014.04</i>
<i>π</i>	<i>6.04</i>	<i>1020.08</i>		
<i>0</i>			<i>-12.95</i>	<i>1007.03</i>
<i>π</i>	<i>2.00</i>	<i>1009.13</i>		
<i>52</i>			<i>1.2</i>	<i>1007.9</i>
<i>+50</i>			<i>1.0</i>	<i>1008.1</i>
<i>53</i>			<i>2.1</i>	<i>1007.0</i>
<i>+50</i>			<i>2.3</i>	<i>1006.8</i>
<i>54</i>			<i>1.3</i>	<i>1007.8</i>
<i>+50</i>			<i>4.0</i>	<i>1005.1</i>
<i>55</i>			<i>1.0</i>	<i>1008.1</i>
<i>0</i>			<i>12.99</i>	<i>996.14</i>
<i>π</i>	<i>422</i>	<i>1000.36 v</i>		
<i>+20</i>			<i>-1.22</i> <i>14</i>	<i>999.0</i>
<i>+50</i>			<i>1.1</i>	<i>999.3</i>
<i>56</i>			<i>1.7</i>	<i>998.7</i>

Typical level notes, left page

July 26 22	Party {	Jones, Level	29
Clear & Warm		White, Rod	
U.S. C&G.S. B.M. N-W Cor. Road Intersection			
		6.04	12.95
		2.00	12.99
		4.22	
		+12.26	-25.94
			+12.26
			-13.68
			1014.04
			1000.36
B.M. Set on Oak Tree 55+20 20' R-R.R. Spike Root			
999.14 H.W. Mark - 1918 - J.W. Morris, Farmer Authority			

Typical level notes, right page

Slope Stakes Lyndale Project					
Roadway 9'					
Sta.	+	H.I.	Grade	Grade Rod	B.M's or T.P.s
π	8.36	1034.51			1026.15
50+00			1032.5	-2.0	
+30			1033.0	-1.5	
+60			1034.5	0.0	
51+90			1036.0	+1.5	
52+00			1036.4	+1.9	
+25			1036.4	+1.9	
o			-3.51		1031.00
π	6.60	1037.60			
57+50			1036.2	-14	
+75			1036.1	-15	
+80			1036.0	-1.6	
o			-12.13		1025.47
π	1.21	1026.68			
+75			1036.1	+9.4	
+80			1036.0	+9.3	

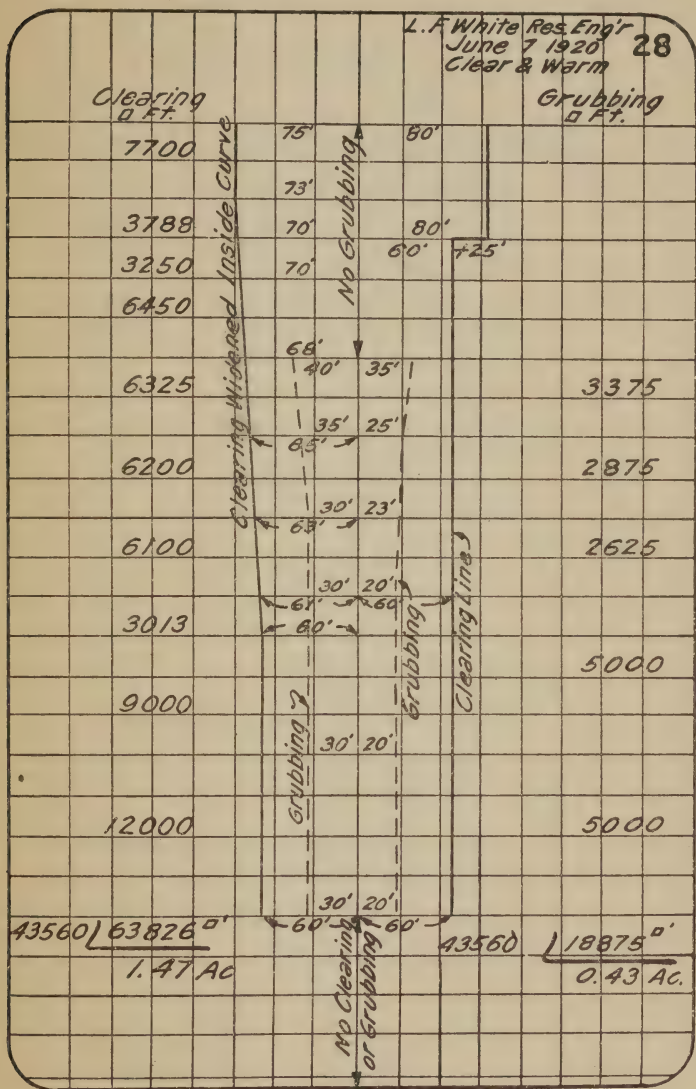
Typical slope stake notes, left page

June 26-22 Clear & Warm					Party { Jones, Leval White, Rod Law, Tape O'Rourke, Axeman	27
U.S.C. & G.S. B.M. N-W. Cor. Road Intersection						
$\frac{-8.0}{21.0}$	$\frac{-6.0}{10.0}$	$\frac{-2.0}{0.0}$	$\frac{-3.0}{6.0}$	$\frac{-6.0}{18.0}$		
$\frac{-3.0}{13.5}$	$\frac{-3.0}{4.0}$	$\frac{-2.0}{0.0}$	$\frac{0.0}{9.0}$			
	$\frac{0.0}{9.0}$	$\frac{0.0}{0.0}$	$\frac{+4.0}{13.0}$			
	$\frac{-4.0}{15.0}$	$\frac{+2.0}{0.0}$	$\frac{+2.0}{12.0}$			
	$\frac{+1.0}{10.5}$	$\frac{+6.2}{0.0}$	$\frac{+3.0}{13.5}$			
	$\frac{+2.0}{11.0}$	$\frac{+3.6}{0.0}$	$\frac{+3.6}{12.6}$			
B.M. R. R. Spike Root 20" Oak 100' R. Sta 50+00						
	$\frac{0.0}{9.0}$	$\frac{0.0}{0.0}$	$\frac{0.0}{9.0}$			
Section Completed Below		$\frac{-3.0}{0.0}$	$\frac{-2.0}{2.0}$	$\frac{-4.6}{6.0}$	$\frac{-5.0}{16.5}$	
			$\frac{-2.9}{3.0}$	$\frac{-6.0}{18.0}$		
T.P. Top Stump 52+80-20' R.						
	$\frac{-14.0}{30.0}$					
	$\frac{-16.0}{33.0}$	$\frac{-28}{0.0}$				

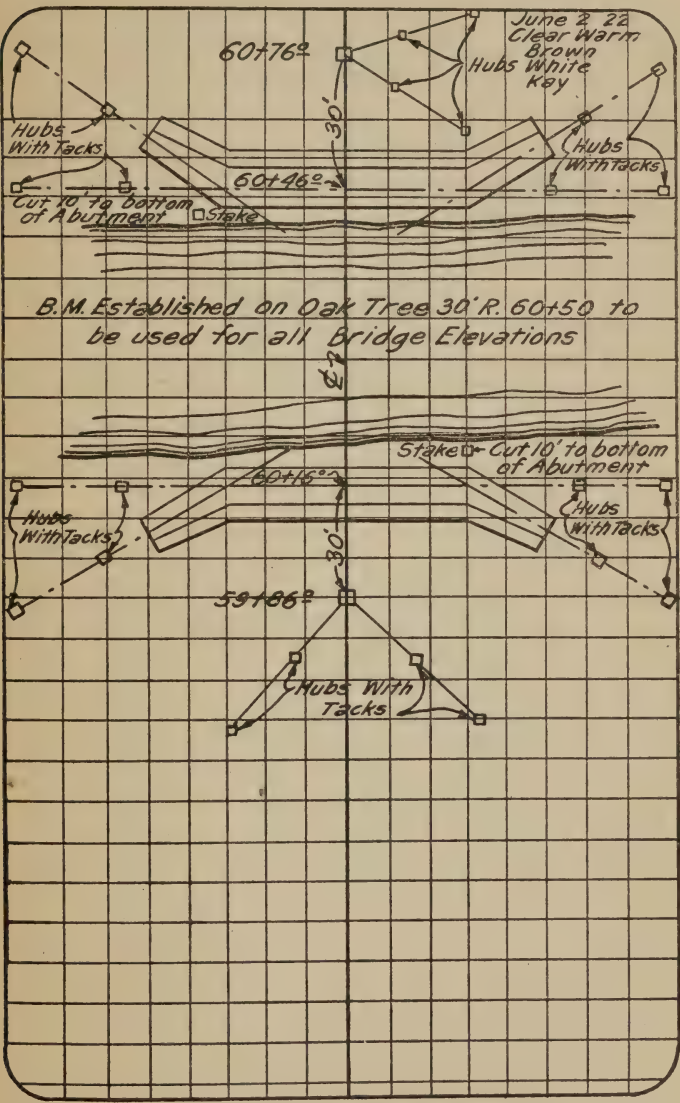
Typical slope stake notes, right page

<i>Clearing & Grubbing Notes-Lyndale Project</i>					
<i>Sta.</i> <i>57+00</i>					
<i>56+00</i>					
<i>55+00</i>					
<i>54+00</i>					
<i>53+00</i>					
<i>52+00</i>					
<i>51+00</i>					

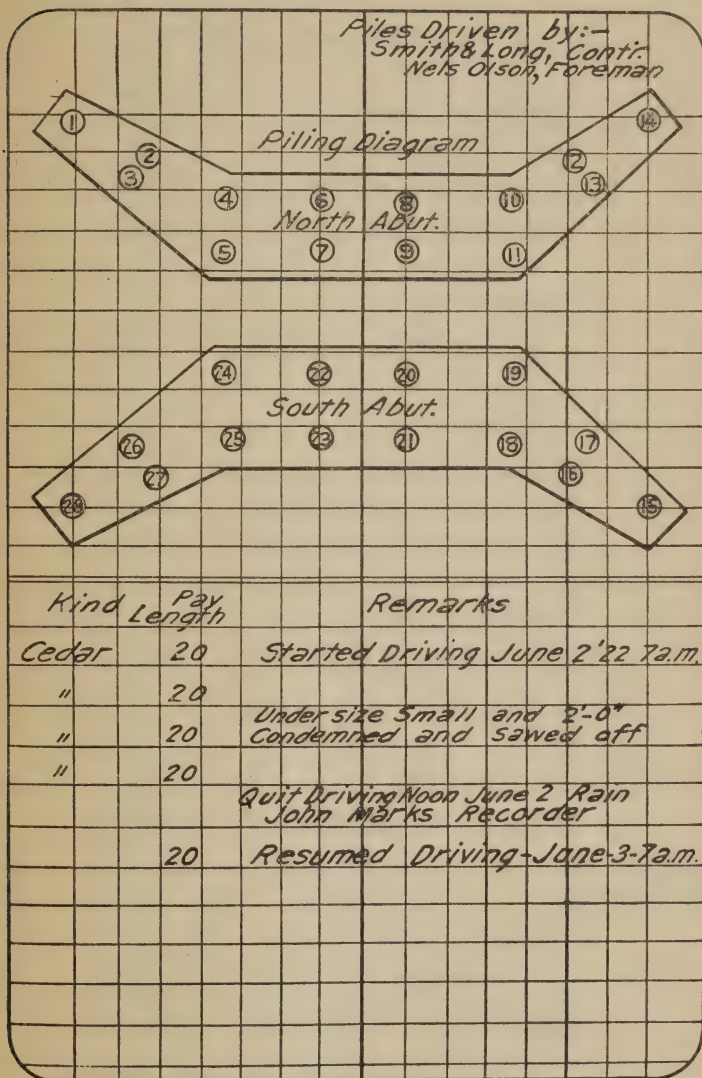
Typical clearing and grubbing notes, left page



Typical clearing and grubbing notes, right page



Typical bridge staking notes, right page



Typical piling notes, right page

<i>Monthly Estimate July</i>				
<i>Item</i>	<i>Station to Station</i>		<i>Total Allowed to Date</i>	
<i>Exc.</i>	<i>420+00</i>	<i>428+00</i>		
	<i>400 C.Y. Earth @</i>	<i>40</i>	<i>160 00</i>	
	<i>40 C.Y. Rock @</i>	<i>2.00</i>	<i>80 00</i>	
<i>Exc.</i>	<i>429+00</i>	<i>432+00</i>		
	<i>100 C.Y. Rock @</i>	<i>2.00</i>	<i>200 00</i>	
<i>Clearing & Grubbing</i>				
	<i>420+00</i>	<i>428+00</i>		
	<i>1.0 A Clearing @</i>	<i>150.00</i>	<i>150 00</i>	
	<i>.5 A Grubbing @</i>	<i>60.00</i>	<i>30 00</i>	
<i>Exc.</i>	<i>435+00</i>	<i>438+00</i>		
	<i>230 C.Y. Earth @</i>	<i>40</i>	<i>92 00</i>	
<i>Bridge</i>	<i>438+60</i>	<i>438+90</i>		
	<i>28 C.Y. Concrete @</i>	<i>30.00</i>	<i>840 00</i>	
<i>Culverts</i>				
	<i>429+10</i>			
	<i>40'X12" C.M.P @</i>	<i>100</i>	<i>40 00</i>	
	<i>End Walls & Cu.Yd. @</i>	<i>20</i>	<i>80 00</i>	

July 1 1922
Clear & Warm

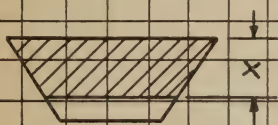
Brown
Jones

30

Cut out 10% Retained for Finishing

10% Allowed for Drilling & Shooting

100% Complete



	x	C.Y.
435	0.0	80
436	4.0	110
437	4.0	40
438	0.0	
Total		230

To Abutments 100% Complete

100% Complete

John Brown,
Res. Engr 7-1-22

<i>Classification Notes-Lyndale Project</i>					
<i>From Station</i>	<i>To Station</i>	<i>Total Excav.</i>	<i>Earth Excav.</i>	<i>Rock Excav.</i>	<i>% Rock</i>
420+00	425+21	300	150	150	50
436+00	442+00	632	600	32	5
449+10	449+60	300	300	00	0
449+60	450+05	200	00	200	100
454+10	458+60	723	720	3	0.4
460+02	464+08	810	405	405	50
460+00	472+00	423	400	23	.54
480+00	485+00	600	300	300	50
		3988	2875	1113	

Typical classification notes, left page

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Remarks

Mike Trenchy Sub-Cont.

" " " "

" " " "

" " " "

Side Barrow on R.

" " " "

O.K. M. J. Cont
6-28-22Claim 60% R
M. T. Cont "

" " " "

Hand Ditching on R.

Ed. Peterson, Sub.

O.K. E. P. 8-22-22

Nels Olson Sub-Cont.

Claim 60% R

N. O. 8-22-22

TOTAL 420 to 485



